Dataset: Effect of habitat, origin, and herbivory on the survival and growth of recruit-sized S. polycystum fronds from MPAs and non-MPAs when reciprocally transplanted

Project(s): Killer Seaweeds: Allelopathy against Fijian Corals (Killer Seaweeds)

Abstract: Raw data on the survival of recruit-sized rammets of Sargassum polycystum originated from marine protected and non-protected areas (MPAs and non-MPAs, respectively) in Fiji, reciprocally transplanted between these areas in two conditions: protected by closed cages or exposed to grazing in partially open cages. Survival data is the average number of days survived by the four MPA rammets and by the four non-MPA rammets in each of the cages. Details in Dell et al. 2016 Plos One. For a complete list of measurements, refer to the supplemental document 'Field_names.pdf', and a full dataset description is included in the supplemental file 'Dataset_description.pdf'. The most current version of this dataset is available at: http://www.bco-dmo.org/dataset/644035

Description: Effect of habitat, origin, and herbivory on the survival and growth of recruit-sized S. polycystum fronds from MPAs and non-MPAs when reciprocally transplanted

Raw data on the survival of recruit-sized ramets of *Sargassum polycystum* originated from marine protected and non-protected areas (MPAs and non-MPAs, respectively) in Fiji, reciprocally transplanted between these areas in two conditions: protected by closed cages or exposed to grazing in partially open cages. Survival data is the average number of days survived by the four MPA ramets and by the four non-MPA ramets in each of the cages. Details in Dell et al. 2016 Plos One.

Related Datasets:

Sargassum mature growth - figure 2

Sargassum mature growth conspecific - figure 4

Sargassum recruit-sized growth and survival with conspecifics - figures 5 and 6

Acquisition Description: [Reference cited below are from Dell et al (2016) Plos One.]

Study site and species:

This study was conducted between January and May in 2013 and 2015 on the coral coast of Fiji's main island, Viti Levu, in the villages of Votua and Vatu-o-lailai (18°12'32S, 177°42'00E and 18°12'13S, 177°41'29E respectively; Fig 1). These villages are ~3km apart and each has jurisdiction over their stretch of reef flat; a habitat ranging between ~1.5 and 3m deep at high tide and between ~0 and 1.5m deep at low tide. In 2002, these villages established small areas (0.8km2 in Votua and 0.5 km2 in Vatu-o-lailai; Fig 1) as no-take MPAs [25]. Though MPA and non-MPA areas were initially similar in coral and macroalgal cover (33-42% macroalgal cover; 3-12% coral cover [25]), MPAs now differ significantly from the adjacent non-MPAs in benthic cover and fish diversity and abundance. MPAs now

have ~56% live coral cover on hard substrate, ~2% macroalgal cover, ~8 fold higher biomass of herbivorous fishes, and higher recruitment of both fishes and corals than the non-MPAs [5,22]. Meanwhile the non-MPAs have lower fish biomass, 5-16% live coral cover on hard substrates and 51-92% macroalgal cover, the majority of which is comprised by Phaeophytes (primarily Sargassum polycystum C. Agardh [22]). In the MPAs, macroalgal cover is restricted to the shallowest, most shoreward areas (where access by herbivorous fishes appears limited), whereas macroalgal cover in the non-MPAs extends throughout the habitat. Thus, over distances of only a few hundred metres, there are dramatic differences in community composition that may impact the efficacy of factors controlling macroalgal populations, without the confounding factors of great differences in space or time.

Effect of habitat and origin on the survival and growth of recruit-sized S. polycystum fronds

Small S. polycystum ramets ~1cm long (range between 0.5cm and 1.5cm) were collected from both the MPA and non-MPA using a nail and hammer so that a small piece of bedrock remained attached to each alga's holdfast, allowing four ramets from either the MPA or the non-MPA to be affixed to ~25cm2 tiles by attaching the rock pieces using aquarium glue (Ecotech Marine, USA). The ramets were selected so that the four on each tile were of equal origin and size and were arranged in a square pattern 1cm distance from each other. The tiles were placed in coolers, containing a few centimetres of seawater and left for 12 hours in the shade to allow the glue to set before moving the tiles to the reef. The tiles were paired so the MPA and non-MPA ramets were of equal size and one tile of each was affixed in a cage so they were 30cm from each other.

These cages were either complete, so the ramets would be protected from fish grazing, or open-sided, so the ramets would be exposed to fish grazing. The open cages lacked the 2 walls parallel to the current direction so that fish access was permitted, while cage effects on flow and shading would be as similar as possible between treatments. The base of each cage was 0.75m x 0.75m, the height was 0.75m and the mesh size was 1cm2 thus excluding all but the smallest fishes and invertebrates. Ten replicates of each treatment were distributed in Votua's MPA and 10 in Votua's non-MPA so that the complete and open cages were paired and the cages in each pair were about one metre apart, while the distance between pairs was ≥ two metres. These cages were distributed ~25 to 50m from shore at a depth of ~1 to 1.5m at low tide.

The experiment was established mid- January 2013, ran for 4 months (112 days), and was checked for ramet mortality every 3 days for the first month and then

every week. If an alga was missing but the stone remained, this was noted as mortality. If the stone was also missing this could have been due to failure of the glue, dislodgement by turbulence, or some unknown agent, so we recorded these as 'lost' and excluded them from analysis. Only ten ramets (3.1%) were lost which reduced the total number of ramets in the experiment from 320 to 310.

Despite running for four months and being checked at intervals of 3-7 days throughout this period, we could detect no growth in this experiment so we report only mean duration of survival. Duration of survival was calculated as the average number of days survived by the four MPA ramets and by the four non-MPA ramets in each cage, giving n=10 for each treatment in each habitat. Difference scores (mean survival duration for MPA versus non-MPA sub-samples in each replicate) were normally distributed ($p \geq 0.200$; Shapiro-Wilk) so the effect of origin was analysed by paired t-test run separately for each treatment in each location.

Processing Description: Comparisons of the two treatments (caged or grazed) were performed by independent samples t-tests as all datasets satisfied the assumptions of normality and homogeneity of variance or were successfully log2 transformed to do so. This analysis was run separately for each origin (MPA and non-MPA) in each habitat. As data were analysed twice, we applied the Bonferroni correction with $\alpha=0.025$ and ran analyses using SPSS version 16.0.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- sorted according to database best practices, with slowest changing columns leftmost
- corrected longitutude from West to East degrees

Deployment Information

Deployment description for Hay_GaTech Fiji_2013

Studies of corals and seaweed were conducted on reef flats within no-take marine protected areas (MPAs) adjacent to Votua, Vatuo-lailai, and Namada villages along the Coral Coast of Viti Levu, Fiji in 2013.

Deployment description for Hay_GaTech Fiji_2015

A study of seaweeds was conducted on reef flats within no-take marine protected areas (MPAs)

and non-MPAs adjacent to Votua, Vatuo-lailai, and Namada villages along the Coral Coast of Viti Levu, Fiji in 2013.

Instrument Information

Instrument	
Description	*local description not specified*
Generic Instrument Name	Scale
Generic Instrument Description	An instrument used to measure weight or mass.